The Curious Case of White Hydrogen

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The Earth is a giant planetary georeactor.

Hollenbach, D. F., Herndon, J. F. (2001) Deep-Earth Reactor: Nuclear Fission, Helium, and the Geomagnetic Field. PNAS. *98*, 11085-11090. Becker, S., *et al*. (2019). Unified Prebiotically Plausible Synthesis of Pyrimidine and Purine RNA Ribonucleotides. Science. *366*, 76-82. Miller, S. L. A (1953) Production of Amino Acids Under Possible Primitive Earth Conditions. Science. *117*, 528-529.

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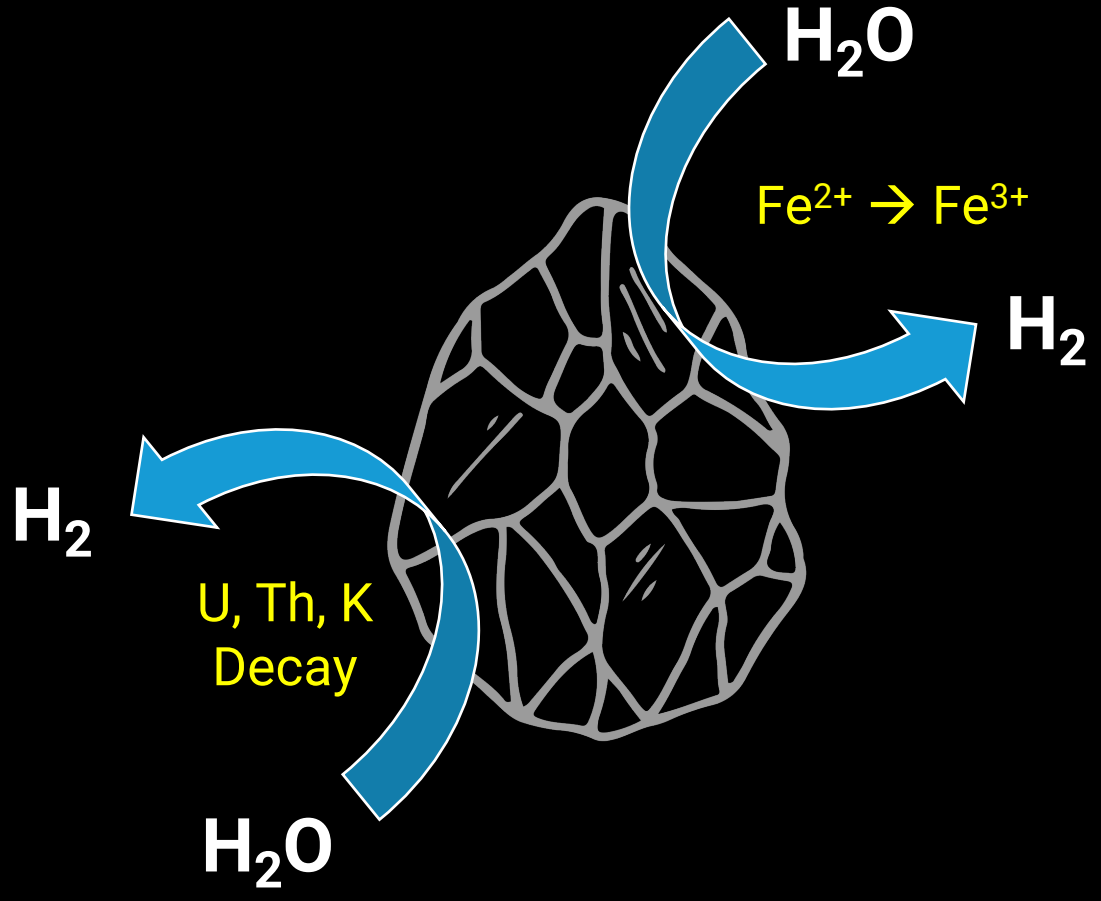
Water and rocks combine to make hydrogen.

Radiolysis



Serpentinization

Images from Wikimedia Commons and Givetash, L. Helium: South Africa Strikes New 'Gold'. October 20, 2021. Phys.org.

Beyond the hype: will hydrogen meet the moment?

70 Mt per year

1.5% global emissions

2% global primary energy demand

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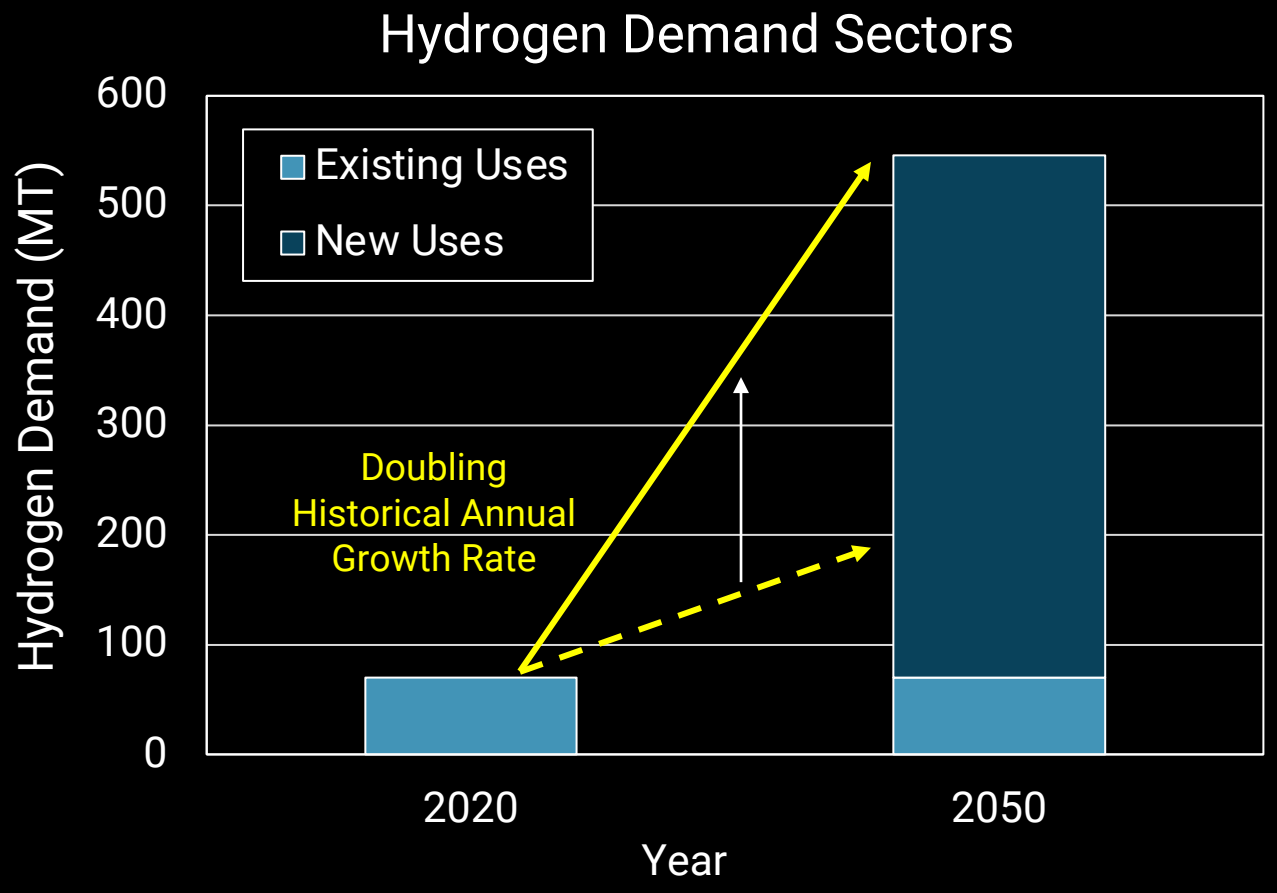
International Energy Agency. *The Future of Hydrogen Seizing Today's Opportunities.* June 2019.

Overhauling an entire industry in 30 years...



1/5 global CO_2 emissions to be stored

> 3 TW renewable energy capacity

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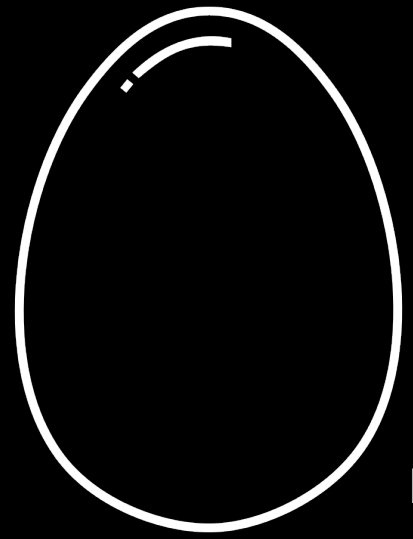
International Energy Agency. *The Future of Hydrogen- Seizing Today's Opportunities*. June 2019. Hydrogen Council. *Hydrogen Scaling Up*. November 2017.

Which comes first?

Low/High-Cost Production

Low- or zero-emissions hydrogen production

What we do today **matters**.



Hydrogen infrastructure

Nascent Demand/Lack of Infrastructure or Market Access

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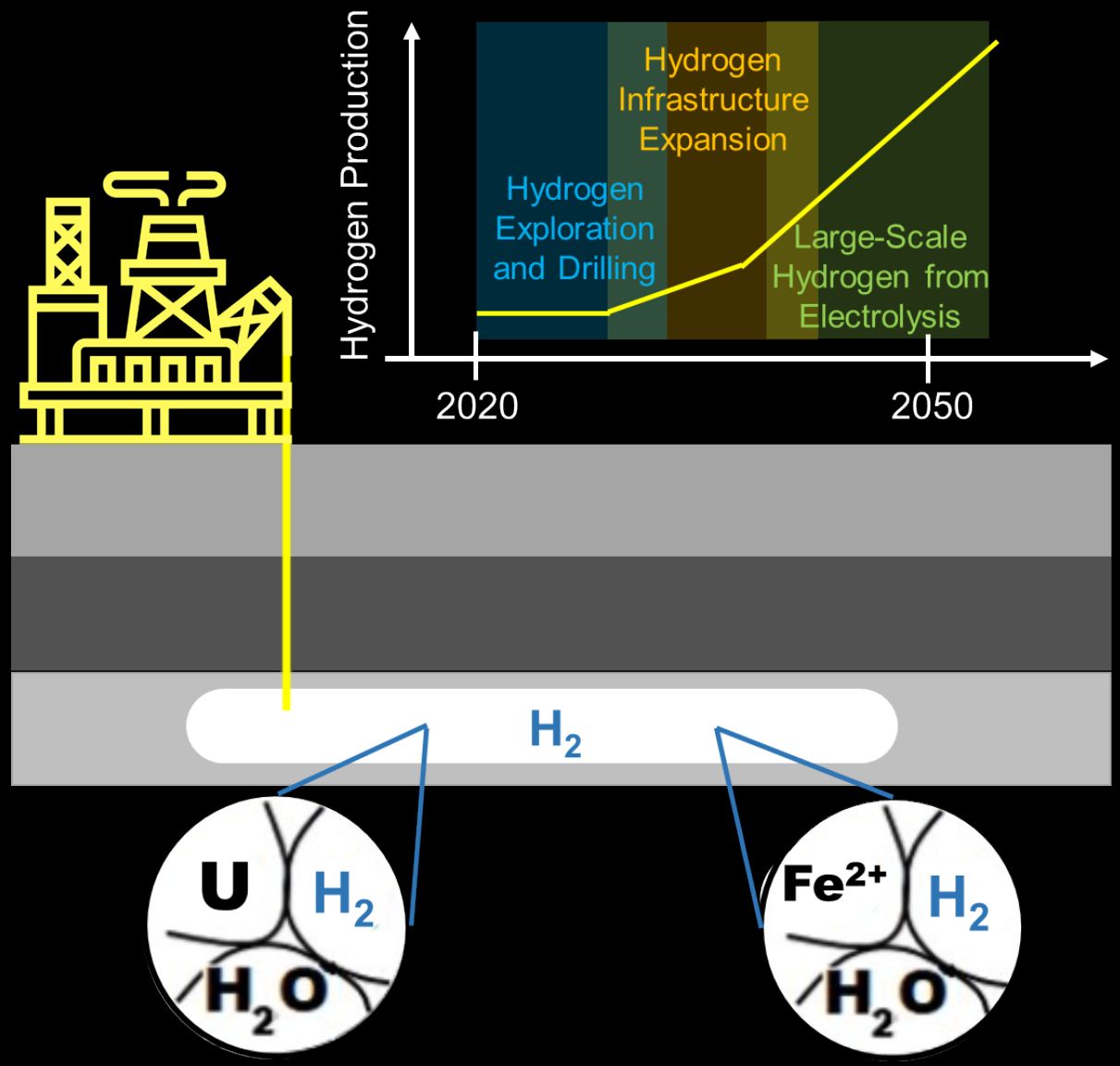
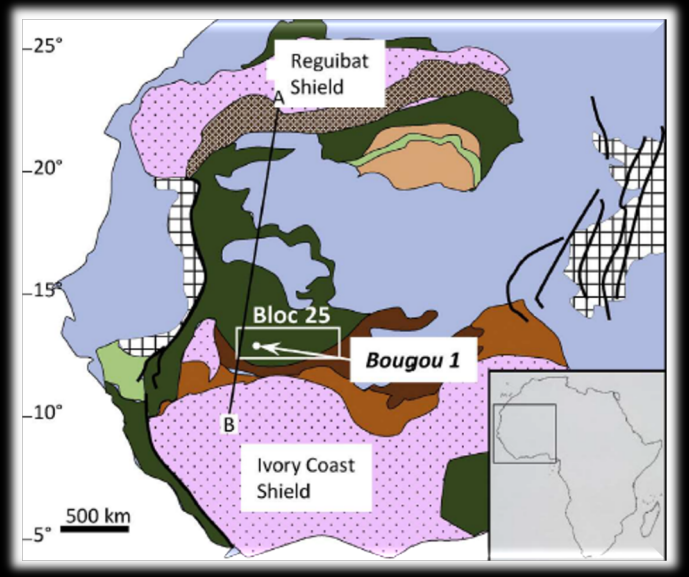
Natural hydrogen as the bridge to a future hydrogen economy.

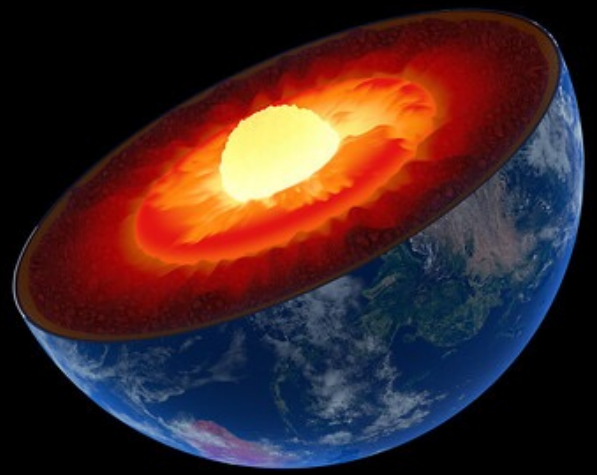


Yedinak, E. (2022) The Curious Case of Geologic Hydrogen: Assessing is Potential as a Near-Term Clean Energy Source. Joule. 6, 503-508.

Extracting hydrogen from the subsurface can short circuit the chicken-and-egg quandary.



Naturally-occurring hydrogen accumulations



Artificially stimulated hydrogen production

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Prinzhofer, A., Tahara Cissé, C. S., Diallo, A. B. (2018). Discovery of a Large Accumulation of Natural Hydrogen in Bourakebougou (Mali). International Journal of Hydrogen Energy. *43*, 19315-19326. Image credit from Argonne National Laboratory and Scott Ableman.

How can we leverage the georeactor beneath our feet?

Thoughts?
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Image Credit: Wikimedia Commons